GAS ABSTRACTS

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GAS ABSTRACTS

GAS ABSTRACTS represents the inauguration of a new phase of service to the Gas Industry by the Institute of Gas Technology, the dissemination of information. GAS ABSTRACTS, which is published monthly, consists of abstracts of papers appearing in current technical journals in the field of gas technology and related subjects.

Scope of Selection: Articles, papers, and books, both theoretical and applied, pertaining to the manufacture, distribution or utilization of natural and manufactured gas will be considered. The periodicals listed on the last two pages will be read regularly. For the time being, only abstracts of those articles which are of immediate interest to our own staff, with a consideration of the interests of research and development men in the industry as a whole, will be considered.

Method of Abstracting: For the most part, the abstracting is done by the research staff of the Institute of Gas Technology. It is intended, in general, that the abstracts supply the technical man with sufficient information about the data contained in the paper to enable him to determine the desirability of reading the entire paper. For some articles which seem of unusual value a more detailed summary will be made.

Classification of Abstracts: The abstracts are grouped together in twelve subject groups and are arranged alphabetically by subject in each group. These subject groups and pages on which the abstracts appear are listed in the Table of Contents.

Format: The publication is prepared in such a manner that the abstracts can be cut and pasted on 5x8 cards for filing. We have considered publishing the abstracts in card form but for the present are unable to do so because of the added time and expense involved.

Annual Index: The preparation of such an index is being considered.

GAS ABSTRACTS (Cont'd)

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1. THE GAS INDUSTRY

A.G.A. RESEARCH

Acker, E. R. A.G.A. RESEARCH AND PROMOTIONAL PLAN. *Gas* 21, 19-22, *1945 (November)*.

This resume of the American Gas Association's Research and Promotion Plan covers its present financial status, outlines the second-year program both as to research and national advertising, and gives in some detail the promotional features of the plan.

--Author's Abstract

Editor's Note: The article gives a detailed breakdown of research program for which $600,000 is set aside per year for a three-year period.

A.G.A. RESEARCH

Hall, E. L. GAS PRODUCTION RESEARCH PROGRAM. *Amer. Gas Assoc. Monthly* 27, *425-426, 1945 (October)*.

Discussion of organization, objective and progress to date of the vastly expanded A.G.A. program designed to provide better gas manufacturing processes.

--Author's Abstract

FPC INVESTIGATION

Poe, E. H. A LOOK AT THE FPC GAS INVESTIGATION. *Amer. Gas Assoc. Monthly* 27, *485-489, 1945 (November)*.

An evaluation of factors involved in the nationwide natural gas study and of the gas industry's position in relation to the mass of conflicting testimony.

LP-GAS INDUSTRY

LIQUEFIED PETROLEUM GASES REPORT MADE. *Oil Paint and Drug Reporter* 148, 7, *1945 (November 5); Natl. Petroleum News* 37, 48, *1945 (November 7)*.

Production and use of liquefied petroleum gases, including the separate fractions and mixtures of propane and butanes, tripled during the last two years, Deputy Petroleum Administrator Ralph K. Davies has disclosed. His disclosure was based on the report of a survey carried out by representatives of the liquefied petroleum gas industry under the direction of the Petroleum Administration for War. The survey covered the entire country, with the exception of PAW's West coast district, which comprises California, Arizona, Nevada, Oregon and Washington. A separate survey was made for the West coast district. According to the survey report, estimated production of liquefied petroleum gas for 1945 was set at 115,064,829 barrels (4,832,722,818 gallons), an increase of 27 percent over the 1944 production of 90,940,378 barrels (3,819,495,876 gallons) and more than triple the 1943 production of 37,800,000 barrels (1,587,600,000 gallons).

I. THE GAS INDUSTRY

LP-GAS INDUSTRY

Hadlick, E. W. SOME PROBLEMS OF THE LP-GAS INDUSTRY TODAY. *LP-Gas* 5, 15-16, *1945, (November).*

The author gives a thoughtful presentation of the value of association work in national, state and local problems. He reports what is being done by the N.B.P.A. in regard to: Help for LP-Gas distributors in the important matter of legislation; proper insurance coverage for all operators; cases involving estimated weights and railroad freight rates. He also briefly discusses supply of equipment, public relations and other current problems.

--Excerpt from Editor's Abstract

RESEARCH

RESEARCH FOR SMALL BUSINESS. *Scientific American* 173, 346-348, *1945 (December).*

A little research into effective means of utilizing research reveals that small businesses can put themselves on a par with big business by making use of available facilities. Government research must benefit all and hence must fail in at least one of its avowed purposes.

--Author's Abstract

RESEARCH

SCIENCE vs. POLITICS CHALLENGE TO CHEMICAL INDUSTRY AND PROFESSION. *Chem. & Met. Eng.* 52, 101, *1945 (November).*

RESEARCH

Mc Bride, R. S. POLICY BATTLES BACK OF THE PROPOSED RESEARCH FOUNDATION. *Chem. & Met. Eng.* 52, 99-100, *1945 (November).*

RUSSIA'S GAS INDUSTRY

Babin, N. GAS INDUSTRY IN THE SOVIET UNION. *Gas Times* 44, 166-167, *1945 (September 8); Amer. Gas Assoc. Monthly* 27, 472, *1945 (October).*

The end of the war has accelerated the development of natural gas resources in Russia. A huge natural gas deposit was discovered in 1942 by the gas surveyors about 16 miles from Saratov. By the end of 1945 a 500 mile long pipe line will transport about 50 million cu. ft. of natural gas per day from the Saratov region to Moscow. Two large gas pockets in the Ukraine are expected to furnish gas to the city of Kiev and Western Ukraine for several decades. The total length of this line will be 323 miles. Manufactured gas is also produced on a large scale in Russia. Leningrad is to be supplied with gas made from slate deposits in Estonia and the Leningrad region.

--J.J. Sebastian

I. THE GAS INDUSTRY

UTILITIES

Reed, H. W. NEW RESPONSIBILITIES OF MANAGEMENT. *Amer. Gas Assoc. Monthly* 27, 490-493, 1945 *(November)*.

Organized Gas Utilities through the A.G.A. must assume wide responsibility in improving gas utilization, by appliance and apparatus research and development.

--G.D. Creelman

2. APPLIANCES

AIR CONDITIONING

Pierce, H. C. AN ALL-YEAR GAS AIR CONDITIONING UNIT. *Mech. Engineering* 67, 171-174, 189 *(March); Refrig. Eng.* 50, 413-416, 450, 1945 *(November).* Abstracted in *Gas Abstracts* 1, *No.* 2,1 *(May).*

The general construction and operation of the gas-fired Servel Air Conditioning Unit is described. Projected models will have cooling capacities of 3.5 and 7.5 tons of refrigeration. The 3 ton unit will have a heating capacity of 120 M. Btu. The 5 ton units will consist of two models having heating capacities of 120 and 180 M. Btu, respectively. The 7.5 ton unit will have balanced heating capacity. Each unit consists of a steam boiler, heating coils, and an absorption refrigeration system using water vapor as a refrigerant and lithium bromide as an absorbent. Steam from the boiler is carried to heating coils during the heating season but during the summer this steam is diverted to the generator of the absorption refrigeration system. Forced air is circulated over heated or cooled coils, as needed, and then through ducts into the living quarters.

--J. Massier

BURNERS

Mills, H. E. (to Mills Engineering Co.). GAS BURNERS. *2,385,528. September 25, 1945.*

A range top burner with a removal refractory or ceramic burner head.

--R.C. Gardner

BURNERS

Morton, W. A. (to Union Mining Co.). BURNER. *2,385,153 September 18, 1945.*

A burner for use in a furnace that provides simple means of adjusting the flame from a yellow flame to a blue flame without any change in the air or gas supply.

--R.C. Gardner

BURNERS, CERAMIC

Smith, H. W., Jr. HIGH-SPEED METAL-HEATING WITH BURNERS RADIANT CERAMIC. *Materials & Methods (Metals & Alloys)* 22, 1074-1078, 1945 *(October).*

Radiant-cup burner, cell type ceramic burner, and ceramic ribbon-burner are discussed. These ceramic burners have been used to heat solid materials up to 1.5 in. in diameter at a speed of 40 feet per min., for brightening tin-plated strips at a speed of 600 feet per min., and for uniformly heating billets, 6 in. across by 15 in. long, up to 2200° F. in 18 min.

--V.S. de Marchi

3. COAL AND GASIFICATION

COAL - GASIFICATION

Pearson, B. M. GERMAN PRACTICE IN TOTAL GASIFICATION. *Oel und Kohle* 38, 457 *(1942); Gas Times* 45, 33-43, *1945 (September 15).*

The significance and aims of total gasification are discussed in detail from the primary view point of utilization, for the production of town gas and synthesis gas, of crude lignite fuels, brown coal briquettes and certain low-grade bituminous coals. The objective has been a complete gasification which is accomplished either in a single step, the residue being ash, or in two steps when the residue containing sufficient combustible matter is gasified in a separate producer, the low Btu gas thus made being used as a fuel needed for the gasification process itself. While a number of processes have recently been developed for the production of synthesis gas and fuel gas of low heating value which can be used advantageously for underfiring coke oven batteries, releasing thereby large additional quantities of coal gas to domestic and industrial users, only one process has thus far been developed to a commercial scale for the production of gas for long distance distribution. A desirable objective for this purpose is the total gasification of low grade coals at the mines. The total gasification processes may be classified as those for the production of (1) lean producer gas; (2) blue water gas, which is the starting material for chemical synthetic processes; and (3) mixed gas or "double gas" which is a mixture of coal gas and blue water gas resulting from the simultaneous carbonization and gasification of coals. The respective calorific values of the gases thus produced are approximately (1) 105-170; (2) 290-300; and (3) 340-380 Btu per cu. ft. The method of production may be intermittent with alternating blow and run cycles, or continuous. The continuity may be achieved (a) by means of external heating (Bubiag-Didier process; (b) by recycling part of the gas produced which is preheated in regenerators or in a separate part of the equipment in order to supply thereby the required reaction heat (the so-called "spuelgas processes," such as the Koppers system, the Pintsch-Hillebrand process, and the Wintershall Schmalfeldt process); (c) by the employment of continuous oxygen blast (Winkler process, the Lurgi system and the Thyssen-Galocsy process).

--J.J. Sebastian

COAL - GASIFICATION

Pearson, B. M. GERMAN PRACTICE IN TOTAL GASIFICATION. TOTAL GASIFICATION SYSTEMS OPERATED WITH OXYGEN BLAST. *Oel und Kohle* 38, 617 *(1942); Gas Times* 45, 39-44, *1945 (September 29); 40-42, 1945 (October 13).*

Impressive progress has been made in the achievement of continuous and complete gasification of cheap low-grade fuels by the addition of oxygen to the steam introduced into the gasification chamber. The oxygen is continuously blasted together with steam into the generator at such a rate that the heat of combustion liberated is sufficient to supply the heat required for the endothermic decomposition of steam and to keep the fuel bed at the proper temperature. The improved Linde-Frankel process assured the production of oxygen at a favorable price. Three processes which have been introduced into large scale practice are described from

the viewpoint of design and operation of the plants. The Winkler process, developed by the I.G. Farbenindustrie, gasifies coke-breeze or low-grade, slack coals, ranging in size from ¼ in. to 65 mesh, which are kept in a highly turbulent motion by the introduced steam and oxygen or air. The gases made at temperatures varying from 1500-1750° F. range in heating values from 130 to 330 Btu per cu. ft. (after purification). The largest Winkler generator, 70 ft. high and 18 ft. in diameter, produces nearly 3 million cu. ft. of gas per hour, or about 13,500 cu. ft. per sq. ft. grate area per hour. For a gas of 330 Btu heating value (after purification) about 270 cu. ft. of 98% oxygen is used per 1000 cu. ft. of gas produced. The Lurgi process operated under pressure of 10-30 atm. with a fixed fuel bed, using non-caking fuels, such as brown coals, sub-bituminous coal, etc., ranging in size from 1 in. to 3/32 in. The highest temperature in the fuel bed is about 1500° F, and the heating value of the purified gas made ranges from 420 to 475 Btu, depending upon the fuel used. Large units with 8 ft. internal diameter produce 115-145 thousand cu. ft. of gas per hour, or about 2,500 cu. ft. per. sq. ft. cross sectional area per hour. The oxygen used is about 60% of that needed at atmospheric pressure. Difficulties due to the intense heat developed at the point of introduction of the oxygen into the generator were overcome in the Thyssen-Galocsy process. The generator used is essentially a slagging oxygen and steam blown gas producer, employing a fixed fuel bed at a temperature of about 2000° F. The clinker melts and is extracted in fluid form. The size of the generator in one plant is about 8.5 ft. in diameter, producing 830 thousand cu. ft. of gas per hour, ranging in heating value from 300 to 340 Btu.

--J.J. Sebastian

GAS - PRODUCTION

Howie, W. A. DEAR COAL - HIGH WAGES - CHEAP GAS. *Gas Times* 15, 39, 1945 *(October 27)*.

With the present tendency for higher wages and coal cost, the following means of producing gas at the cheapest possible price are suggested: (1) modernization of existing carbonizing plants; (2) decreasing the cost of manufacture of carburetted water gas; (3) lowering the fuel expenditure index; (4) installation of an electric detarrer; (5) use of electric power delivered to the plant. The cu. ft. of gas made per ton of coal is no criterion of duel efficiency from a national viewpoint in regard to gas production since the coke produced for sale contains by far the greater number of therms as compared with gas, tar and light oil made from the same quantity of coal. For every cwt. of coke (112 lb.) converted into gas one should be able to produce an equivalent of 2688 cu. ft. of 500 Btu gas to maintain the low fuel expenditure index established in some plants. Therefore, gas engineers should always be on guard for wastage of fuel in carbonizing plants. It would be better for many small gas undertakings, with an output of less than, say, 100

million cu. ft. per year, to close down and change these plants into gasholder stations to supply the small towns and farm localities. On the other hand, a great number of medium sized undertakings (200-400 million cu. ft. per year), whose fuel expenditure index is from 18 to 25 per cent, should be retained in operation at full capacity, any additional gas requirements being supplied in bulk by the nearest larger undertaking.

--J.J. Sebastian

4. NATURAL GAS

NEW PRODUCTS

Hohenadel, H. P. SOME FUTURE PRODUCTS FROM THE SYNTHESIS OF PETROLEUM AND NATURAL GAS. *Mining and Metallurgy* 26, 576-578, 1945 (November).

New products of the chemical industry for which the petroleum and natural gas industry will be called upon to supply much of the raw material include synthetic resins or plastics, synthetic textiles and chemicals for textile treatment, bonding adhesives, wood-treating chemicals, and the silicones. These are likely to be mass-production industries, requiring sizable quantities of the products of our oil and gas wells, for they will enter into our food, clothing, shelter, and transportation, four fundamentals of modern civilization.

--Excerpt from Author's Abstract

RESERVES

Fagin, K. M. EFFECT OF RESERVOIR DEPTH ON GAS RESERVES. *Petroleum Eng.* 17, 256-260, 1945 (October).

Importance of deeper, higher pressure gas fields is illustrated by charts and tables showing how recovery increases with depth.

--Author's Abstract

5. FUELS AND COMBUSTION

COAL - HYDROGENATION

Faragher, W. F. GERMANS MADE HIGH AROMATIC AVIATION GASOLINE BY COAL HYDROGENATION. *Natl. Petroleum News* 37, 851-857, 1945 *(November 7)*.

The paper is based on a TIIC report (Index No. 101) entitled, "Investigations by Fuels and Lubricants Teams at the I.G. Farbeindustrie A.G. Works at Ludwigshafen and Oppau." Synthetic oil in Germany was derived by high pressure liquid phase hydrogenation of various materials, including bituminous coal, brown coal, bituminous coal tar, brown coal tar and petroleum oil residues. The newer coal hydrogenation plants employed 700 atm. instead of 300 atm. pressure and utilized alkaline catalyst conditions, instead of the older acid catalyst conditions. The yield for a given reaction volume was increased 60% by the use of higher pressures and more complete conversion was effected so that over-all improvement in gasoline plus middle oil yields was 7-8%. High, aromatic aviation gasoline was made by three methods. 1. The gasoline plus middle oil obtained from the liquid phase hydrogenation was hydrogenated in a vapor phase operation at 300 atm. pressure and 400-410° C over either a tungsten sulfide or tungsten sulfide-nickel sulfide-alumina catalyst. This step saturated the oil and removed nitrogen compounds which are detrimental in the splitting operation which follows. Saturated gasoline is low in octane and is separated and treated in the D.H.D. process (described below). The middle oil is reacted over tungsten sulfide on activated terrana at 410-420° C and 300 atm. and gives 60% of gasoline. 2. The two steps have been combined in a single stage process operating at 700 atm. and 450° C over a chrome oxide-molybdic oxide-Florida earth catalyst. A more aromatic gasoline was produced which was desirable for aviation gasoline. 3. Saturation naptha from the two stage process was subjected to the D.H.D. process which is similar to the Hydroforming process developed in this country. The naptha along with hydrogen is passed over a 10% molybdic oxide on alumina catalyst at 510-520° C and 25-70 atm. pressure. The aromatics in the product are 65-68%. The over-all yield of final product is 9% less than that obtained in the direct 700 atm. process. The finished product contains 40-45% aromatics and has an octane number of around 90 leaded. The total yield of aviation gasoline was reduced about 20% by means of the process described above but hydrocarbon gases produced were utilized for the manufacture of alkylate aviation gasoline.

--C.H. Riesz

COAL - HYDROGENATION

Guthrie, V. B. NAZIS DROPPED FISCHER-TROPSCH PROCESS FOR COAL HYDROGENATION. *Natl. Petroleum News* 37, 4, 44,46 1945 *(October 31)*.

Information obtained by the U.S. Technical Oil Mission indicates that for the production of synthetic fuels, the Germans favored coal hydrogenation and had discontinued the erection of new Fischer-Tropsch plants early in the war. Evidence has been found that I.G. Farbenindustrie exerted political pressure in favor of dehydrogenation. Some of the reports of the oil mission have been released.

--C.H. Riesz

5. FUELS AND COMBUSTION

FUEL FROM FARM WASTES

EXPERIMENT TO MANUFACTURE LIQUID FUEL FROM FARM WASTES UNDER WAY. *Steel* 117, 101, 1945, *(November 12)*.

Department of Agriculture's research laboratory of Peoria, Illinois to test feasibility of converting corncobs into alcohol and by-products. Success may indicate large potential market for equipment, not only at home but in foreign countries.

--Author's Abstract

GASOLINE - OXIDIZING CRACKING

Berents, L. I. and Glushnev, V. E. VAPOR PHASE OXIDIZING CRACKING OF OIL PRODUCTS. *Natl. Petroleum News* 37, 912-920, 1945 *(November 7)*. *(Translated from Russian by J. G. Tolpin)*.

A comparative study showed that the velocity of oxidizing cracking exceeds that of cracking in the absence of air. However, this regularity is only valid for temperatures not exceeding 700-720° C. A rise of the concentration of oxygen in the air-hydrocarbon mixture within the limits investigated increases the reaction velocity, other conditions being equal. Cracking of gasoline with air can be described by the equation for reactions of the first order. Equations for the dependence of the velocity constant (calculated by the constant for mono-molecular reactions) upon temperature are given, and the energy of activation of cracking of gasoline with air and in the absence of air determined. The decisive factors in the process of oxidizing cracking for high quality motor fuel are the concentration of oxygen and duration of the reaction. By oxidizing cracking a high extent of conversion of the charge and increased yields of aromatics can be achieved at lower temperatures than those required in ordinary cracking.

--Author's Abstract

LUBRICATING OIL PLANT - GERMAN

FOUR UNDERGROUND LUBRICATING OIL PLANTS WERE BEING CONSTRUCTED BY THE GERMANS. *Natl. Petroleum News* 37, 858-859, 1945 *(November 7)*.

Four underground lubricating oil plants had been planned by the Germans, none of which was ever in operation, A description of the Porta plant, near Minden, is presented. This plant was located in an old sandstone quarry and was 90% complete.

--C.H. Riesz

6. PETROLEUM

PETROLEUM INTERESTS ABROAD

AMERICAN PETROLEUM INTERESTS IN FOREIGN COUNTRIES. *Natl. Petroleum News* 37, 18-22, *1945 (October 31)*.

Story of investment abroad of more than two billion dollars told by industry group in 600 page report to O'Mahoney senate committee; text of summary and conslusions.

PETROLEUM REFINING - CATALYTIC CRACKING

Newton, R. H. and Shimp, H. A. THE DESIGN AND OPERATING FEATURES OF HOUDRY FIXED BED CATALYTIC CRACKING UNITS. *Petroleum Eng.* 17, 240, 243, 246-254, *1945 (October)*. Abstracted in *Gas Abstracts* 1, *No. 3, 21 (June)*.

Distinctive original features of the Houdry catalytic cracking units are described, by means of which automatic control of a cyclic operation over a bed of pellet catalyst is secured. Earlier published data on this process has been principally on its refining aspects. The design and operating features embodied in present units were based on intensive studies of the relation of carbon deposits on the catalyst to yield of gasoline, varying depths of cracking, space rates and other factors, to insure that commercial designs provided optimum operating conditions. Desired flexibility in operations is secured through multiple cases. An interesting aspect of the Houdry fixed bed units is the application of the gas turbine to power recovery.

--Author's Abstract

PETROLEUM REFINING - CATALYTIC CRACKING

Simpson, T. R., Eastwood, S. C. and Shimp, H. G. LIQUID CHARGE TECHNIQUE IN T.C.C. PROCESSING. *Oil & Gas J.* 44, *119-129, 1945 (November 24)*.

An adaptation of the T.C.C. process, called "liquid-charge technique", permits catalytic cracking of the heaviest types of petroleum charge stocks. It involves concurrent downward flow of oil and catalyst in the reactor. Heated oil is sprayed down upon the moving catalyst bed, 70 per cent of the cracking occurs in the initial 12 per cent of the reactor bed and cracked vapors are removed at the bottom of the reactor bed. The catalyst-to-oil ratio should be in the range of 1.8 to 4.0. The charge stocks should preferably have less than 4 per cent by weight of carbon residue (Conradson) to keep coke deposition at reasonable levels. Heavy asphaltic stocks must be deasphalted before charging. Gasoline yields under typical operating conditions averaged 50 per cent with coke deposits of 6.4 - 8.0 per cent by weight.

--C.H. Riesz

6. PETROLEUM

PLUTONIUM

Goodman, C. PETROLEUM vs. PLUTONIUM. *Oil & Gas J.* 44, 227-248, 1945 *(November 17)*.

A comprehensive summary of the information that has been released about atomic energy, prepared for the meeting of the American Petroleum Institute.

RESOURCES

Wilson, R. E. OIL FOR AMERICA'S FUTURE. *Petroleum Eng.* 17, 166-174, 1945 *(October)*.

The article is a digest of testimony presented October 3, 1945, before a special committee investigating petroleum resources which Senator Joseph O'Mahoney was chairman.

--Excerpt from Author's Abstract

SHALE OIL - RECOVERY

NEW PROCESS OF SHALE OIL RECOVERY. *World Petroleum* 16, 81, 1945 *(September)*.

"A new method for extracting petroleum from oil shale has been developed by the Socony Vacuum Oil Company, Inc., and placed at the disposal of the U.S. Bureau of Mines... In their experimental studies, Socony-Vacuum scientists recovered between 17 and 40 gallons of oil from each ton of shale, depending on operating conditions, the highest yield representing 14 per cent by weight of raw shale...Socony-Vacuum's method employs a vertical retort, 67 feet high; the shale is preheated at 500 degrees Fahrenheit by the counter-current flow of hot gases which sweep the oil vapors from the retort...The crushed raw shale passes down through a tower, countercurrent to a stream of heating gases which raises the temperature of the shale to about 1000° F. The shale flows through the retort by gravity. The heating gases are introduced at the bottom of the retorting zone. The oil vapors and escaping gases are taken off at the top of the retort and the oil is recovered in a series of condensers. The spent shale is withdrawn from the bottom. Low pressure steam is introduced just above the spent shale drawn off to cool it and recover heat for retorting...Approximately 60 per cent of the oil was recovered in a hot (300 degree Fahrenheit) condenser and the remaining 40 per cent was recovered as an emulsion with condensed steam in a water-cooled condenser at 55° F., the emulsion being easily broken in a centrifugal to obtain waterfree oil."

--Excerpt from article

SYNTHETIC CHEMICALS

Smith, F. SYNTHETIC CHEMICALS FROM PETROLEUM. *Petroleum* 8, 206-208, 1945 *(November)*.

The first instalment in this series (p. 163) introduced an abridged version of Sir Frank Smith's Cantor lecture delivered before the Royal Society of Arts, specially prepared for the readers of this journal.

6. PETROLEUM

Previous Cantor lectures were reviewed, the petroleum chemical industries discussed, and petroleum hydrocarbons characterized. The second instalment (pp. 184–185) dealt with synthetic fuels, engine development, molecular forces, action of double bonds, change of state–gas to solid. The third and concluding instalment discusses polar forces, dielectrics, monomers and polymers, natural and synthetic rubbers, petroleum-derived chemicals, thermoplastic and thermosetting materials, polythene, polyisobutylene and polystyrene, polyvinyl and polymethylmethacrylate, plastics, and condensation polymers.

—Author's Abstract

7. ANALYTICAL METHODS AND TESTS

SULFUR - DETERMINATION

Hinckley, J. A., Wilson, M. C., McKnight, H., and Corson, B. B. DETERMINATION OF SMALL AMOUNTS OF SULFUR IN NAPHTHALENE. *Ind. Eng. Chem. Anal. Ed.* 17, 642-645, 1945 (October).

An analytical method described for the determination of sulfur in naphthalene is applicable to the sulfur range of 0.002 to 2%. This method involves the combustion of naphthalene in a current of purified air and the turbidimetric determination of sulfur as barium sulfate. It is applicable not only to naphthalene but to other high-boiling organic materials. Incidentally, a variable, high-current, low-voltage transformer, a gas-lift absorber of small holdup, and an infra-red technique for evaporating analytical samples are described.

--Author's Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

ACETYLENE - HYDROCARBON MIXTURES - EXPLOSIBILITY

Jones, G. W., Kennedy, R. E., Spolan, I., and Huff, W. J. EFFECT OF PRESSURE ON THE EXPLOSIBILITY OF ACETYLENE-HYDROCARBON MIXTURES. *U.S. Bur. Mines, R.I. 3826, 1945 (September).*

The investigation was initiated to determine the effect of air in acetylene as a possible cause of explosions in medium pressure (15 psig) acetylene generators. It was found that pure dry acetylene becomes explosive at and above 5.9 psig. If the acetylene is moist, the hazard of explosion is less; when the mixture contains 14.5% or more water vapor, it is impossible to explode the mixture at 15 psig. The presence of air in acetylene up to 10% by volume does not increase the hazard of explosion, i.e., such mixtures require higher pressures than pure acetylene to produce explosive conditions. Mixtures containing 25% or more of air can be exploded at atmospheric pressure. Moisture in acetylene-air mixtures reduces the hazard of explosion; the most dangerous mixtures are those which contain no water vapor. The addition of a hydrocarbon gas, such as natural gas, propane or butane, exerts a stabilizing influence on acetylene. The effectiveness increases with the molecular weight of the hydrocarbon. Propane appears to be suitable for use in medium-pressure acetylene generators for this purpose.

--C.H. Riesz

CARBON DIOXIDE - PARAFFIN SYSTEMS

Poettmann, F. H. and Katz, D. L. PHASE BEHAVIOR OF BINARY CARBON DIOXIDE-PARAFFIN SYSTEMS. *Ind. Eng. Chem.* 37, 847-853, *1945 (September).*

The vapor-liquid equilibria and critical loci were studied for the following systems: carbon dioxide-propane, carbon dioxide-butane, carbon dioxide-pentane. A single plot shows the transition from the carbon dioxide-ethane system which forms constant boiling mixtures to the carbon dioxide-pentane system which behaves normally. Other data are presented in both graphical and tabular form.

--C.H. Riesz

CORROSION

Holmber, M. E. and Prange, F. A. CORROSION IN HYDROFLUORIC ACID ALKYLATION. *Ind. Eng. Chem.* 37, 1030-1033, *1945 (November).*

HYDROCARBONS - ENTHALPIES

Scheibel, E. G. and Jenny, F. J. NOMOGRAPHS FOR ENTHALPIES OF PURE HYDROCARBONS AND THEIR MIXTURES. *Ind. Eng. Chem.* 37, 990-995, *1945 (October).*

Three nomographs present the vapor and liquid enthalpies of individual hydrocarbons and hydrocarbon mixtures. The first gives the enthalpies of normal saturated paraffins from methane to n-octane. The second

nomograph shows the liquid and vapor enthalpies of mixtures of light hydrocarbons based on the average molecular weight of the mixture. The third nomograph gives the liquid and vapor enthalpies of the heavier petroleum fractions.

--Excerpt from Author's Abstract

LUMINOSITY

Whittingham, G. INFLUENCE OF SULFUR OXIDES ON THE LUMINOSITY OF COAL GAS FLAMES. *Nature* 156, 207 (1945).

The addition of 5% SO_2 to a luminous smoky flame causes the luminosity to disappear. Adding 5% SO_2 to a normally aerated Bunsen flame shortens the outer cone and gives a purple color to the dark blue region. The addition of 0.1-0.2% SO_3 increases the luminosity of coal-gas flames; of 1% increases the luminosity of aerated flames.

--C.A. 39, 5069, 1945 (November 10)

METHANE - THERMODYNAMIC PROPERTIES

Corcoran, W. H., Bowles, R. R., Sage, B. H., and Lacey, W. N. THERMODYNAMIC PROPERTIES OF METHANE AT LOW TEMPERATURE. *Ind. Eng. Chem.* 37, 825-828, 1945 *(September)*.

The thermodynamic properties of methane from 70° to 230° F and from atmospheric pressure to 1400 psi absolute have been derived from data existing in the literature, and are presented in tabular and graphical form.

--Excerpt from article

PARAFFINS - VAPOR-LIQUID EQUILIBRIA

Hanson, G. H. and Brown, G. G. VAPOR-LIQUID EQUILIBRIA IN MIXTURES OF VOLATILE PARAFFINS. *Ind. Eng. Chem.* 37, 821-825, 1945 *(September)*.

Two five-component mixtures were prepared of volatile paraffin hydrocarbons having critical temperatures of approximately 100° F. and critical pressures of about 2000 pounds per square inch absolute. Vapor-liquid equilibrium determinations were made on these two mixtures at 100° F. and at pressures up to that of the single phase. Equilibrium constants at 100° F. from these two mixtures have been compared with equilibrium constants from a binary and a ternary mixture, each of which has a critical temperature of 100° F. and a critical pressure of approximately 2000 pounds per square inch absolute. Within the limits of experimental error it appears that the equilibrium constants of the volatile paraffin hydrocarbons in binary or complex mixtures of paraffins may be defined by specifying the temperature, pressure, and "convergence pressure" corresponding to the temperature of the equilibrium. The convergence pressure is the critical pressure of a mixture at its critical temperature. At any other temperature the convergence pressure is the pressure at which the equilibrium constants appear to converge to unity.

--Author's Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

VAPOR-LIQUID EQUILIBRIA

White, R. R. VAPOR-LIQUID EQUILIBRIA IN NON-IDEAL SOLUTIONS. *Trans. Amer, Inst. Chem. Engr.* 41, 539-555, 1945 (October 25).

Relationships are presented which make it possible to correlate and smooth experimentally obtained low pressure vapor-liquid equilibrium data for many non-ideal poly component systems. Data for binary systems are useful for predicting the behavior of those of greater number of components.

—J.D. Parent

9. ORGANIC CHEMISTRY

ACETYLENE

Hasche, R. L. ACETYLENE CHEMISTRY. *Chem. Eng. News* 23, 1840, 1945 (October 25).

Examination of the German chemical industry reveals that remarkable progress has taken place in acetylene chemistry. The following brief report by an investigator outlines developments. Further detailed and technical information will soon appear in reports from the Office of the Publication Board.

--Author's Abstract

ACETYLENE - PRODUCTION

ACETYLENE FROM NATURAL GAS METHOD IN PILOT-PLANT STAGE. *Natl. Petroleum News* 37, 36, 1945, (November 7).

Operation of a pilot plant large enough to determine actual commercial costs of manufacture is being planned by Dr. E. P. Schoch, University of Texas chemist, as the next step in the development of his method for manufacturing acetylene from natural gas. Dr. Schoch and his associates since 1929 have been working on the electrical discharge method of making acetylene from methane, but until now they have not had the facilities for manufacturing the product on a sufficient scale to permit cost determinations.

--Excerpt from article

ACETYLENE - PRODUCTION

ARC CRACKING OF GASES YIELDS ACETYLENE FOR BUTADIENE IN HULS RUBBER PLANT. ACETYLENE PRODUCTION BY ELECTRIC ARC CRACKING, AND ITS PURIFICATION. *Natl. Petroleum News* 37, 865-868, 1945 (November 7).

The discussion is based on a TIIC report entitled, "Synthetic Rubber Plant, Chemische Werke-Huls (Index No. 189)". Rated capacity of the Huls plant was 4000 tons of Buna S rubber per month. Gases which consisted essentially of methane and ethane were passed over 7000 volt electric arcs. Conversion is about 50% of acetylene per pass and 5-6% of carbon black is also formed. Acetylene is absorbed in water at 18 atm. and after being stripped out under vacuum, a 97% product is obtained. Ethylene was also a product of the arc process and was also obtained from selective hydrogenation of acetylene. Acetylene was converted successively to acetaldehyde, aldol, butylene glycol and butadiene. Ethylene was used for production of styrene. Butadiene and styrene were co-polymerized to Buna S. Data on acetylene yields and costs are included.

--C.H. Riesz

9. ORGANIC CHEMISTRY

ALKYLATION

BUTANE DRIER IN ALKYLATION PLANT SAVES 5 TONS OF CATALYST A DAY. *Natl. Petroleum News* 37, 869-870, *1945 (November 7)*.

A low cost, high capacity separator is described. Liquefied butane feed for an alkylation unit is passed through a grid of wood shavings (excelsior) and entrained water is dropped out. The water content is reduced from an inlet value of 0.02-.03 to 0.008-.011 volume per cent on the outlet side, of which 0.005 to 0.007% is undissolved water.

--C.H. Riesz

CATALYSTS, FISCHER-TROPSCH

Aldrich, Lt. R. C. MANUFACTURE, REGENERATION OF FISCHER-TROPSCH CATALYST. *Natl. Petroleum News* 37, 922-924, *1945 (November 7)*.

The discussion is based on a portion of a TIIC report "Fischer-Tropsch Process (Index 373)," which is a description of the operation of a plant at Harnes, France. The commercial catalyst used in all Fischer-Tropsch operations was the standard cobalt catalyst; analysis of the finished catalyst at Harnes was as follows:

CO	18.0%
ThO_2	0.9
MgO	1.8
Kieselguhr	79.3
	100.0

About 200 men were employed in the operation and maintenance of a 350 bbl. per day plant. Of these, 40 were employed in catalyst manufacture and regeneration. The catalyst preparation consists in dissolving the appropriate quantities of cobalt, thorium and magnesium as nitrates by means of nitric acid. In a second tank, 10% sodium carbonate is prepared. The contents of the two tanks are mixed in a third tank to obtain a mixture with a pH of 7.2. Calcined kieselguhr is added and the mixture thoroughly agitated. After washing and filtering, the product is dried at 120° C and a 4 mm. size is obtained. The catalyst is then reduced by means of hydrogen at 350° C. The regeneration of catalyst consists in dissolving the spent catalyst containing all the catalyst ingredients as well as sulfur in nitric acid. Cobalt and calcium nitrates are separated from the other metals by addition of sodium fluoride which precipitates calcium fluoride. Thorium carbonate which is insoluble at pH of 4.2 is redissolved in nitric acid; upon addition of sodium hydroxide, magnesium and iron are precipitated as hydroxides. Thorium hydroxide is precipitated from the solution upon heating to 80° C. Magnesium hydroxide is not recovered because of its low value.

--C.H. Riesz

9. ORGANIC CHEMISTRY

CATALYSTS, HYDROGENATION

Eidus, Ya. T. CATALYSTS FOR HYDROGENATION OF CARBON MONOXIDE BY THE JOINT APPLICATION OF THE DYNAMIC AND THE STATIC METHODS. PT. III. ROLE OF THE ALKALINE ACTIVATOR IN THE FORMATION OF THE SURFACE OF THE $Fe-Cu-ThO_2-K_2CO_3-$ KIESELGUHR CATALYST. *Bull. de l'Academie des Sciences de l'URSS Classes des Sciences Chimiques* 1945, 62-70. (In Russian with English summary). See *Gas Abstracts* 1, *No.* 3, 8; *No.* 6, 17 for previous articles in this series.

The reactions of carbon dioxide in the presence of the complex catalyst $Fe-Cu-ThO_2-K_2CO_3$-kieselguhr (100:25:2:2:125), as well as certain combinations of the components of this catalyst, have been studied at 258° C. It was found that catalytic hydrogenation of carbon dioxide by hydrogen did not occur. Carbon dioxide did react with the contact surface. The results indicate that the alkaline activator is the catalyst component which causes this combination and thoria promotes the process. The mechanism of the reaction is discussed in view of these findings.

--C.H. Riesz

DIOLEFINS - PRODUCTION

Frey, F. E. (to Phillips Petroleum Co.) DIOLEFIN PRODUCTION. *U.S.P. 2,376,425. May 22, 1945.*

Butadiene and other diolefins are produced from hydrocarbons containing two to four carbon atoms per molecule. High temperature, low pressure treatment of an unsaturated C_2-C_3 fraction, obtained as an initial step in the process, leads to diolefin formation.

--C.H. Riesz

FISCHER-TROPSCH REACTION

Aldrich, Lt. R. C. SYNTHETIC LUBRICANTS MADE AT TWO PLANTS IN FRANCE. *Natl. Petroleum News* 37, *859-860, 1945 (November 7).*

Synthetic lubricants were made by reacting a chlorinated Fischer-Tropsch gas oil with benzol and dichlorethane in the presence of about 10% by weight of aluminum chloride at 70-110° C (Standard Kuhlman process). A high viscosity index and low pour point are characteristic of the oils produced. A pilot plant of the Kuhlman Company at Harnes was studing the manufacture of lubricating oil by polymerization of an olefinic Fischer-Tropsch gas oil in the presence of 3% aluminum chloride. These oils are low in quality and oxidize readily.

--C.H. Riesz

FISCHER-TROPSCH REACTION

FISCHER-TROPSCH AND HYDROGENATION PLANTS IN RUHR VALLEY STUDIED BY JOINT MISSION. *Natl. Petroleum News* 37, *861-864, 1945 (November 7).*

The discussion is based on the report, "CIDS Investigation of Ruhr Synthetic Oil Plant (Index No. 17)." High-lights of the Fischer-Tropsch and hydrogenation processes are presented after inspection of ten plants.

--C.H. Riesz

9. ORGANIC CHEMISTRY

FISCHER-TROPSCH REACTION

'O.X.O.' PROCESS MADE HIGHER ALCOHOLS FROM FISCHER-TROPSCH OLEFINS. *Natl. Petroleum News* 37, 926-930, *1945 (November 7)*.

The material is based on a portion of a TIIC report entitled, "Report on Visit to Oil Targets in the Ruhr and Hanover Areas (Index No. 3)." A brief description of the "O.X.O." (German military code name) plant at Halter is presented. The plant was never in operation but it was designed to convert C_{12} to C_{17} olefins to aldehydes by passage together with sulfur-free water gas over standard Fischer-Tropsch catalyst at 135° C and 150 atm. pressure. The aldehydes were to be hydrogenated over nickel catalyst to alcohols which were to be used in making sulfonic soaps.

--C.H. Riesz

FISCHER-TROPSCH REACTION

FISCHER-TROPSCH PLANTS GAVE NAZIS DIESEL, MOTOR FUELS, LUBRICANTS. *Natl. Petroleum News* 37, 924, *1945 (November 7)*.

A brief digest is presented of the operation of the Fischer-Tropsch plant at Harnes, France, based on a TIIC report, "Fischer-Tropsch Process (Index 373)" the plant was producing 288 bbls. per day. Synthesis gas was made from high temperature coke in conventional water gas generator. The proper ratio of hydrogen to carbon monoxide was obtained by passing a portion of the gas over an iron shift catalyst. The gas was then freed of sulfur compounds and was passed to one of the 24 reactors which operated at about 3 lbs/sq. in. gauge pressure. The reactor is essentially a square box consisting of 600 thin baffles pierced by 600 tubes filled with hot water. The weight of the reactor is about 60% of that of solid steel. The catalyst is placed in the voids between baffles and tubes. Of the 24 reactors, 16 are used for an initial pass; after intermediate product removal, the gases are delivered to the remaining 8 reactors for a second pass.

--C.H. Riesz

HYDROCARBONS - CRACKING

Greensfelder, B. S. and Voge, H. H. CATALYTIC CRACKING OF PURE HYDROCARBONS. *Ind. Eng. Chem.* 37, 1038-1043, *1945 (November)*.

Cracking of eleven naphthenes containing 6 to 18 carbon atoms was studied over a silica-zirconia-alumina catalyst. It was found that naphthenes are quite susceptible to the action of the catalyst and that both the ring and any side chains contribute to the total cracking. The rate of cracking increases rapidly with increased molecular weight. Secondary reactions of isomerization and saturation play an important part in determining the final products. Catalyzed cracking at 500° C. proceeds at about one thousand times the rate of thermal cracking, and there are significant differences in the product distributions.

--Author's Abstract

9. ORGANIC CHEMISTRY

HYDROCARBONS - ISOMERIZATION

Schulze, W. A. (to Phillips Petroleum Co.). HYDROCARBON CONVERSION. *U.S. 2,374,507 April 24, 1945.*

Isomerization of paraffinic hydrocarbons is accomplished with aluminum halide, solid inorganic filler, and liquid hydrocarbon in form of a slurry, suspended in hydrocarbon. Reaction conditions specified are: temperature, 150 to 700° F, and pressure, atmospheric to 1000 lbs. per square inch.

—M. Miyaji

STYRENE - PRODUCTION

Mavity, J. M., Zetterholm, E. E. and Hervert, G. STYRENE PRODUCTION BY CATALYTIC DEHYDROGENATION - LOW PRESSURE OPERATION. *Trans. Amer. Inst. Chem. Eng.* 41, *519-528, 1945 (October 25).*

The catalytic dehydrogenation of ethylbenzene to styrene was investigated with particular regard to operating variables including: pressure (80 mm. absolute to 50 lb./sq. in. gauge), temperature (550-630° C), space velocity, and process period (usually 30 minutes). U.O.P. commercial dehydrogenation catalyst was employed. The maximum conversion to styrene in a once-through operation was 66.1% at 630° C and 250 mm. With recycling, the indicated ultimate yields are of the order of 90%. The lowest carbon formation (0.17%) was at 80 mm. absolute and on recycling an ultimate yield of 95% would be expected.

—C.H. Riesz

10. DEVELOPMENT ENGINEERING

AMMONIA, DISSOCIATED - USE

Snell, C. V. EFFECTIVE USE OF DISSOCIATED AMMONIA. *Metals and Alloys* 22, 727-730, *1945 (September)*.

The advantages of dissociated ammonia over cylinder tanks of hydrogen and nitrogen is the lower cost of production, less expense required in cylinder handling, and less safety hazard. The equipment required for a small and a large unit and the description of what part each apparatus takes is given. Dissociation of ammonia will give a 75% hydrogen, 25% nitrogen mixture. By using dissociated ammonia burners, any desired quantity of hydrogen from 1% to 75% may be obtained. Dissociated ammonia is used to an advantage in bright annealing of alloys, brazing applications, atomic hydrogen welding, and in powder metallurgy.

--S. Mori

CORROSION PREVENTION

Creel, W. H. CONTROLLING CORROSION IN REFINERIES PROCESSING SOUR CRUDES. *Oil & Gas J.* 44, 132-141, *1945 (October 20)*.

Plant experience at Phillips Petroleum Company during the last 17 years has shown the following: The 5% Cr-0.5% Mo alloy has been extensively used and its average life for topped crude service is less than 2 years, for gas oil cracking service between 2 and 2½ years, in reforming service between 4 and 5 years. Carbon steel has a reasonable service life for temperatures below 450° F. For extremely high temperatures and severe oxidation, 18-8 alloy has proven to be the most economical. Monel metal liners have been used successfully to combat hydrochloric acid corrossion. Where pump erosion or abrasion is particularly severe, excellent results have been obtained by using parts coated with Stellite or Colmonoy. A 12 Cr-0.2 C alloy has given excellent results as pump plunger when exposed to dust and sand.

--V.S. de Marchi

CORROSION PREVENTION

Morgan, C. L. ZINC ANODES FOR PREVENTING CORROSION OF DISTRIBUTION MAINS. *Petroleum Eng.* 16, 196, 198, 200, 202, 205, 208, *1945 (September)*.

DIFFUSION

NEW PROCESSES AND IMPROVED EQUIPMENT DEVELOPED AT OAK RIDGE U235 PLANT. *World Petroleum* 16, 86, *1945 (November)*.

In the petroleum industry separation and purification of hydrocarbons is expected to be improved. The diffusion method developed for the separation of U235 from U238 may be employed for the separation of ethylene from cracked gases, helium from natural gas and direct recovery of gasoline from natural gas without absorption and distillation.

--Excerpt from article

10. DEVELOPMENT ENGINEERING

GAS TURBINES

Cunningham, J. F. Jr. METALLURGICAL PROBLEMS IN GAS TURBINES. *Metal Progress* 48, 484-8 (1945).

Metal requirements and fabricating problems are enumerated. The use of improved Ni-Cr alloys will increase operating temperature 100° F. and efficiency from 29-33%.

--C.A. 39, 4824, 1945 (November 10).

ORIFICE METER CHARTS - READING

Faull, H. A. SIGHT READING OF ORIFICE METER CHARTS. *Petroleum Refiner* 24, 143-145, 1945 (October).

The fundamentals of orifice metering with both M charts and 1-10 charts are discussed. Relative merits of each for various load conditions are set forth. The calculations of specific chart readings, by means of the fundamental orifice meter formula, are given.

--M.F. Knoy

PROCESS EQUIPMENT

TRENDS IN PROCESS EQUIPMENT DEVELOPMENT. *Chemical Industries* 57, 849, 1945 (November).

Recent plant equipment applications disclose three important trends: (a) Old specialized operations are being reduced to the status of unit operations. (b) Increased use is being made of equipment types which combine several functional operations into a single process step. (c) Development of continuous processing has progressed at a rapid rate aided by more efficient equipment, greater mechanization, and better control instruments. Underlying these application trends are the many minor improvements which have enabled designers to produce better equipment: (a) Developments in chemical engineering theory have improved the accuracy of designs and opened new avenues of approach. (b) Continued introduction of new construction material has broadened the field of equipment design for special services. (c) Many minor improvements in mechanical devices have extended range of equipment performance.

--Excerpt from article

STEELS, HEAT RESISTANT

Lincolin, R. A. SELECTING THE PROPER HEAT-RESISTANT STEEL. *Iron Age* 156, 74-77, 1945 (November 8).

The effect of oxidizing, carburizing, and sulfurizing atmospheres on chromium-nickel steels at high temperatures are reviewed and evaluated as to their capabilities and limitations.

--V.S. de Marchi

II. CHEMICAL ENGINEERING

FLUID FLOW

Buthod, P. and Whiteley, B. W. PRACTICAL PETROLEUM ENGINEERING. FLUID FLOW. *Oil & Gas J.* 44, 120-122, 1945 (November 3).

This is the third article in a series designed to show how time saving charts can be used in pipe flow problems. The Fanning factor is to be found from the usual type of chart involving the Reynolds number and pipe roughness. The head loss per 1000 ft. of pipe can be found from a chart once the Fanning factor is known.

--J.D. Parent

FLUID FLOW

Buthod, P. and Whiteley, B. W. PRACTICAL PETROLEUM ENGINEERING. *Oil & Gas J.* 44, 286-289, 1945 (November 17).

This is the fifth in a series of articles on graphic solutions of fluid flow design problems. It deals with the resistance of fittings of graphs presented for the equivalent length of pipe fittings of various diameters in the turbulent range.

--J.D. Parent

FLUID FLOW

Buthod, P. and Whitley, B. W. PRACTICAL PETROLEUM ENGINEERING. *Oil & Gas J.* 44, 130-132, 1945 (November 24).

This is the sixth of a series of articles on graphic solutions of design problems. Although no graphs are given except a compressibility factor chart developed by G. G. Brown for certain hydrocarbon mixtures, some valuable basic thermodynamic equations are stated. The conservation law in its usual forms is stated, as is the Dorcy or Fanning equation. The compressibility factor is very briefly discussed.

--J.D. Parent

Abstractor's Note:

The reviewer would like to point out that the conservation law is not quite properly stated due to the usual confusion between mass and weight units. Readers are referred to "Chemical Engineers Handbook" by Perry for correct statement. Further, the equation of continuity is inaccurately stated as $U_1P_1 = U_2P_2$ instead of $A_1U_1P_1 = A_2U_2P_2$, where A = area, U = linear velocity and P = density.

STEEL - CHANGES DURING HEATING

Smith, G. V., Miller, R. F., and Tarr, C. O., STRUCTURAL CHANGES IN CARBON AND MOLYBDENUM STEELS DURING PROLONGED HEATING AT 900-1000° F. AS AFFECTED BY DEOXIDATION PRACTICES. *Petroleum Eng.* 16, 210-214, 1945 (September).

The microstructure and the hardness of 3 carbon (0.1%) steels and 6 molybdenum steels (0.1-0.2% C) (0.5% Mo) tempered at elevated temperatures below 1100° F during periods ranging from 5 to 5000 hours were studied. The results obtained show that (1) The hardness of most carbon steels increased with time of tempering. Further increase in time caused a

decrease in about the same rate as all three temperatures (900, 1000 and 1100° F). Increase in hardness was greatest at 1000° F. (2) Carbon steel was not influenced by the method of deoxidation. (3) Annealed molybdenum steel behaved quite similarly to carbon steel but normalized molybdenum steel behaved differently. (4) Normalized molybdenum steel formed spheroids and agglomerates. These increased with addition of aluminum and silicon. Aluminum alone gave a lower rate. (5) The rate of graphite formation was the same for all carbon steels but for molybdenum samples the rate increased with the addition of aluminum and silicon.

--S. Mori

THERMODYNAMICS

Brancker, A. V. CHEMICAL THERMODYNAMICS. *Petroleum* 8, 149, *1945 (August).*

This is the fifth in a series of articles wherein the elements of chemical thermodynamics are treated. The accent is on the practice utility of thermodynamics. Such topics as specific heats, the first two laws and thermo-chemistry were covered in earlier papers. The present installment treats entropy primarily. Some theoretical and empirical means of calculating entropies of substances are given.

--J.D. Parent

TOLUENE - PURIFICATION

Drickamer, H. G., Brown, G. G. and White, R. R. VAPOR-LIQUID EQUILIBRIA IN PHENOL-HYDROCARBON SYSTEMS. *Trans. Amer. Inst. Chem. Engr.* 41, 555-607. *1945 (October 25).*

Vapor-liquid equilibria at atmospheric pressure have been obtained on systems encountered in the purification of toluene from petroleum including mixtures of toluene, methylcyclohexane, paraffin hydrocarbons, and phenol. These data have been correlated on the basis of relationships, previously proposed.

--Author's Abstract

TOLUENE - PURIFICATION

Drickamer, H. G. and Hummel, H. H. APPLICATION OF EXPERIMENTAL VAPOR-LIQUID EQUILIBRIA TO AN ANALYSIS OF THE OPERATION OF A COMMERCIAL UNIT FOR THE PURIFICATION OF TOLUENE FROM PETROLEUM. *Trans. Amer. Inst. Chem. Engr.* 41, *607-630. 1945 (October 25).*

The vapor-liquid equilibria presented in the previous paper are applied to two tests on the toluene purification unit of the Pan-American Refining Corporation. The average tray efficiency obtained on the toluene recovery tower was 50% while the stripper efficiency was 45%. A McCabe-Thiele diagram, drawn on a phenol-free basis, is used for studying the fractionation in the toluene recovery tower. This process for toluene purification is licensed by the Shell Development Company.

--Author's Abstract

13. NEW BOOKS

Bell, H. S. AMERICAN PETROLEUM REFINING. 3rd. edition, New York, D. Van Nostrand Co., Inc., 1945.

Burk, R. E. and Grummitt, O. (Editors). FRONTIERS IN CHEMISTRY. Vol. IV. MAJOR INSTRUMENTS OF SCIENCE AND THEIR APPLICATIONS TO CHEMISTRY. *New York, Interscience Publishers, Inc., 1945.*

The book has chapters on Electron Diffraction and the Examination of Surfaces, The Electron Microscope and Its Applications, X-Ray Diffraction and Its Applications, Chemical Spectroscopy, Application of Absorption Spectra to Chemical Problems, The Infra-red Spectrometer and Its Application.

Dept. of Scientific and Industrial Research. METHODS FOR THE DETECTION OF TOXIC GASES IN INDUSTRY. No. 1. Hydrogen Sulfide; No. 2 Hydrogen Cyanide Vapors; No. 3 Sulfur Dioxide; No. 4 Benzene Vapor; No. 5 Nitrous Fumes; No. 6 Carbon Bisulfide Vapor; No. 7 Carbon Monoxide; No. 8 Phosgene; No. 9 Arsine; No. 10 Chlorine; No. 11 Aniline Vapor; No. 12 Organic Halogen Compounds. London, His Majesty's Stationery Office, 1943.

Education Sub-Committee of the Fuel Efficiency Committee of the British Ministry of Fuel and Power. Amer. Edition. THE EFFICIENT USE OF FUEL. *Brooklyn, Chemical Publishing Co., Inc., 1945.*

This is an unusually complete text-book on fuels and their efficient utilization, for the use of students and technical men in industry. A wide field is clearly covered, including fundamental knowledge on coals, coke, gases and electricity; sampling and analysis of fuels; principles of combustion and gasification; flow of heat and fluids and their measurement; heat loss calculations and heat balances. In addition, combustion in practice, boiler efficiency and testing, water purification and boiler equipment, furnaces, refractories and insulating materials are amply discussed. There are chapters on the use of pulverized fuel in boilers; operation of producers; utilization of fuel oils and steam for industrial purposes and space heating; drying operations; automatic control and instrumentation. Although the text refers to British fuels and equipment, the principles and methods discussed are adaptable to American practice. Existing difference between British and American practice can readily be ascertained by reference to American technical literature, which freely covers the subject.

--J.J. Sebastian

Liddell, D. M. (Editor). HANDBOOK OF NON-FERROUS METALLURGY. New York, McGraw-Hill Book Co., 1945.

Stewart, A. W. and Wilson, C. L. RECENT ADVANCE IN PHYSICAL AND INORGANIC CHEMISTRY. *New York, Longmans, Green and Company, 1944.*

The authors attempt, with considerable success, to present a survey of a number of those chemical fields which have made such spectacular progress in recent years. These include such topics as spectra, radioactivity, isotopes, X-ray and electron diffraction studies and a section on the hydrides. The treatment provides a useful though somewhat superficial

picture of progress in these fields. The authors tend, perhaps, to labor the historical backgrounds of their topics. Detailed discussion of such developments as Thomson's "Positive Ray Analysis" or Crooke's Tubes are rather unnecessary in a period which finds the mass spectrograph and the betatron in commercial production. The narrative style of presentation makes the book very readable, and it provides a pleasant, painless refresher course for one whose curiosity about current developments is not too profound.

--S. Katz

Twiss, S. B. ADVANCING FRONTS IN CHEMISTRY. VOL.I. HIGH POLYMERS. *New York, Reinhold Publishing Corporation, 1945.*

This is a series of lectures sponsored by Wayne University in which are discussed the structure, physical properties and the mechanism of formation of high polymers. The lectures are by well known workers in the field and a broad range of topics is covered. The brevity of each lecture limits the discussions to generalization or topic outline. The lectures are very readable and would be of interest to those casually interested.

--F.L. Estes

Yarwood, J. HIGH VACUUM TECHNIQUE. THEORY, PRACTICE, INDUSTRIAL APPLICATIONS AND PROPERTIES OF MATERIALS. London, Chapman & Hall, Ltd., 1945.

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List of Periodicals Received

A.A.A.S. BULLETIN
ALLIS CHALMERS ELECTRICAL REVIEW
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS: BULLETIN
AMERICAN CHEMICAL SOCIETY: JOURNAL
AMERICAN GAS ASSOCIATION: MONTHLY
AMERICAN GAS JOURNAL
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